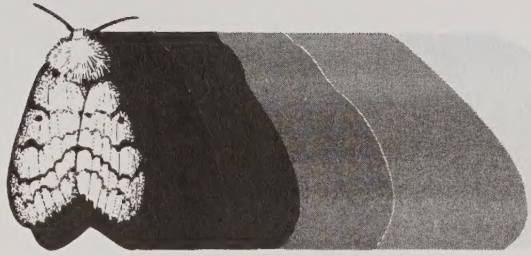


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# GYPSY MOTH NEWS

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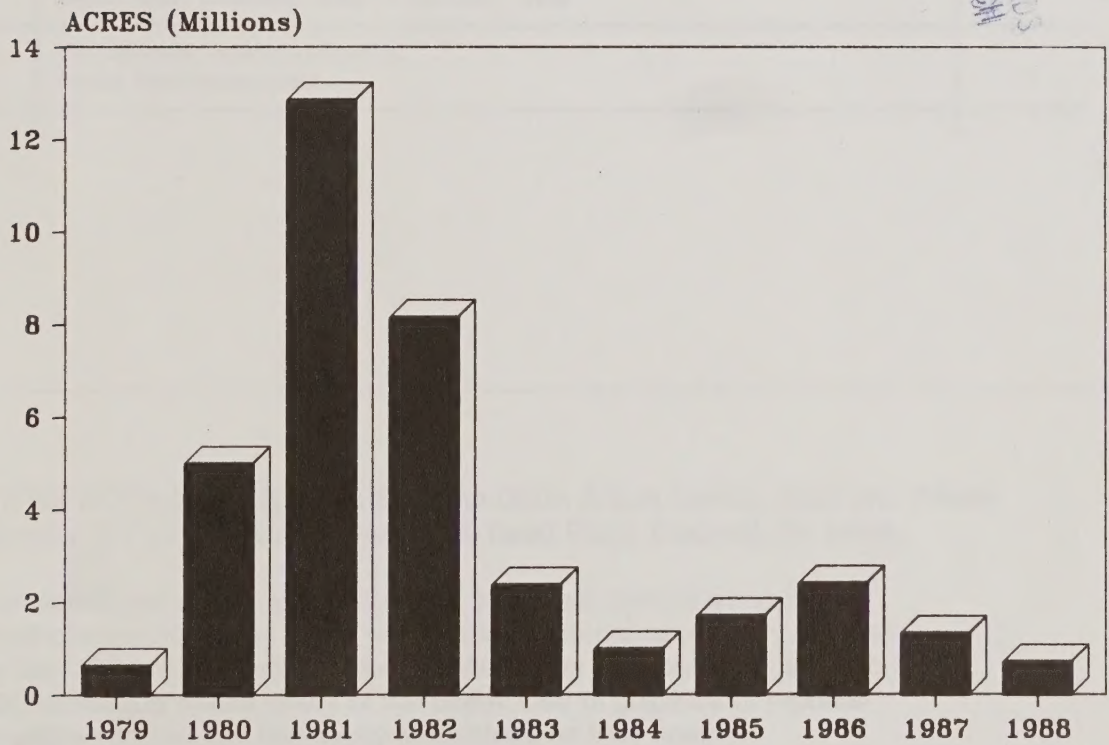
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## GYPSY MOTH DEFOLIATION, 1979-1988



Prepared by H.Machesky, USDA FS,  
Forest Pest Management, Morgantown, WV.





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GYPSY MOTH NEWS is a service of the USDA Forest Service, State and Private Forestry, Forest Pest Management, 370 Reed Road, Broomall, PA 19008.

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Address any correspondence to the Editor.

Editor  
Daniel B. Twardus

Managing Editor  
Helen A. Machesky

Gypsy Moth News





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## From the Editor

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The USDA Forest Service operates the world's largest forestry research organization. One part of that effort is gypsy moth research conducted by the Northeastern Forest Experiment Station headquartered in Broomall, PA. Two of the Station's research work units (projects) are focused upon in this issue: Silvicultural Options for the Gypsy Moth located in Morgantown, WV; and Pathology and Microbial Control of Insects Defoliating Eastern Forest Trees, located in Hamden, CT. Both Units play a major part in the Forest Service gypsy moth Research effort. Three other Research Units also have gypsy moth responsibilities. They are Ecological Management of Northeastern Forest Insect Pests, and Host-Pest Interactions both located in Hamden, CT. A new Unit, Applications of Biotechnology in Forest Pest Management is located in Delaware, OH.

Here are brief descriptions of two gypsy moth Research Work Units.

D. Twardus

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## Silvicultural Options for the Gypsy Moth

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Research Work Unit NE-4507, **Silvicultural Options for the Gypsy Moth**, is located at USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505. The Unit is a recent addition to the Forest Service's Gypsy Moth Research and Development Program, and was started in April 1983. Its mission is to provide silvicultural options and forest management guidelines for reducing damage associated with gypsy moth defoliation in northern hardwood and oak-hickory forest types. There are three problem areas under this mission. The first area deals with research on effects of damage by the gypsy moth and associated organisms and the use of haz-

ard rating and geographic information systems to manage and predict those effects. The second problem area concerns research on the effectiveness of silvicultural practices in reducing damage by gypsy moth. The third area of research involves the development of computer models and decision-support systems to help resource managers in evaluating and selecting gypsy moth management strategies. The Unit currently has four research scientists and one vacant scientist position.

**Kurt W. Gottschalk**, Supervisory Research Forester and Project Leader: Primary area of interest is the use of silvicultural treatments to minimize gypsy moth impacts and interactions of gypsy moth with forest stands. Kurt has been a member of the Unit in Morgantown since its beginning in 1983 and has been Project Leader since May 1987. Before moving to Morgantown, Kurt was a Research Forester in Warren, PA, for 4 years working on oak regeneration. His undergraduate degree in Forestry was from Iowa State University and graduate degrees were from Michigan State University.

Kurt's current research topics are: testing silvicultural treatments to minimize gypsy moth impacts, evaluating effects of gypsy moth on forest stands and forest regeneration, development of decision support tools for use by forest managers and pest managers for cost effective gypsy moth control, and physiological responses of trees to defoliation and other stresses.

Most recent publications:

Gottschalk, Kurt W. 1987. Prevention: The silvicultural alternative. p. 92-104 *In*: Proc. Coping with the gypsy moth on the new frontier, Fosbroke, S. and R.R. Hicks, Jr., eds., West Virginia Univ., Aug 4-6, 1987, Morgantown, WV. West Virginia Univ. Books, 153 p.

Gottschalk, Kurt W. 1988. Gypsy moth and regenerating Appalachian hardwood stands. p. 241-254 *In*: Proc. Guidelines for regenerating Appalachian hardwood stands, Smith, H.C., A.W. Perkey, and W.E. Kidd, Jr., eds., West Virginia Univ., May 24-26, 1988, Morgantown, WV. West Virginia Univ. Books, SAF Publ. 88-03, 293 p.

**Daniel T. Jennings**, Principal Research Entomologist: Primary area of research involves natural enemies of forest insect pests, including spruce budworm and gypsy moth. Dan's expertise is



invertebrate natural enemies; he is the Forest Service expert in araneology (spiders) and has published extensively on natural enemies of the spruce budworm in northeastern spruce-fir forests. His prime interests are determining the effects of silvicultural practices on natural enemy populations, assessing the roles of natural enemies in regulating pest populations, and methods of enhancing natural enemies through silvicultural manipulations. He has worked for several years on assessing the effects of strip-clearcutting on species diversity and evenness of spiders, ants, carabid beetles, and phalangids. His special training includes study at the Biosystematics Research Centre, Agriculture Canada, Ottawa. Dan has just recently transferred to Morgantown from Orono, Maine.

Some recent publications in this area include:

Jennings, Daniel T., Mark W. Houseweart, Charles D. Dondale, and James H. Redner. 1988. Spiders (Araneae) associated with strip-clearcut and dense spruce-fir forests of Maine. *J. Arachnol.*, 16:55-70.

Jennings, Daniel T., and Daniel J. Hilburn. 1988. Spiders (Araneae) captured in Malaise traps in spruce-fir forests of west-central Maine. *J. Arachnol.*, 16:85-94.

Hilburn, Daniel J., and Daniel T. Jennings. 1988. Terricolous spiders (Araneae) of insecticide-treated spruce-fir forests in west-central Maine. *The Great Lakes Entomologist*, 21:105-114.

**Andrew Liebhold**, Research Entomologist: Primary area of interest is the development of models that simulate gypsy moth population biology and interactions of gypsy moth with forest stands. Prior to joining the USDA Forest Service in February of 1988, Sandy worked for 4 years as a postdoctoral research associate at the University of Massachusetts, working on the population dynamics of endemic and epidemic gypsy moth populations. This work focussed on how population processes vary through a variety of spatial scales. He has also been active in the development of new methods for sampling gypsy moth larval and egg mass densities and methods for estimating defoliation.

Currently, Sandy is coordinating several Forest Service projects involving the development of simulation models of gypsy moth population ecology and forest interactions. These models include the Gypsy Moth Life Systems Model, a large systems model of the interaction of gypsy moth with its hosts and its natural enemies and stand-alone components of the life systems model, such as GMPHEN, a simulation model for predicting the timing of gypsy moth life stages. Sandy is also developing other generalized models for forecasting populations over large areas.

Most recent publications:

Liebhold, A.M. and J.S. Elkinton. 1988. Estimating the density of larval gypsy moth, *Lymantria dispar* (Lepidoptera: Lymantriidae), using frass drop and frass production measurements: sources of variation and sample size. *Environ. Entomol.* 17(2):385-390.

Liebhold, A.M., J.S. Elkinton, D.R. Miller, and Y.S. Wang. 1988. Estimating oak leaf area index and gypsy moth, *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae), defoliation using canopy photographs. *Environ. Entomol.* 17(3):560-566.

**Mark J. Twery**, Research Forester: Primary area of research is in the impact of defoliation by gypsy moth on the forest, including mortality and growth impacts on existing stands and effects on regeneration and composition of future stands. Mark recently completed his dissertation, in which he characterized the changes in the vertical distribution of wood production in the boles of trees defoliated by gypsy moth. He is currently studying the distribution and abundance of *Armillaria* root rot in oak stands after defoliation. Mark is also continuing to follow the effects of the defoliations of the 1980's on oak stands in central Pennsylvania. Other current work includes study of the regeneration of oak stands in central Pennsylvania and northern West Virginia after defoliation and/or silvicultural treatments.

Most recent publication is:

Twery, M.J. 1987. Changes in vertical distribution of xylem production in hardwoods defoliated by gypsy moth. Ph.D. Thesis, Yale University. 96 p.



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## Pathology and Microbial Control of Insects Defoliating Eastern Forest Trees

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Research Work Unit NE-4502, **Pathology and microbial control of insects defoliating Eastern forest trees**, is located at USDA Forest Service, 51 Mill Pond Road, Hamden, Connecticut 06514. Its mission is to conduct research on microbial diseases of insects that defoliate eastern forest trees; to evaluate their effectiveness in regulating natural populations; to optimize natural and artificially induced diseases as major components in integrated pest management systems.

The project (Research Work Unit) has three stated problems:

- (1) to improve insect pathogens and develop and improve formulation/application technology;
- (2) to develop the capability to forecast naturally occurring virus epizootics; and
- (3) to develop and evaluate integrated pest management (IPM) strategies to manage the gypsy moth.

Personnel assigned to the project include three scientists and five technicians.

**John Podgwaite** is a microbiologist whose research interest is the epizootiology of the nucleopolyhedrovirus (NPV) in gypsy moth populations. He currently pursues this interest through cooperative agreements with Dr. Al Wood at Boyce Thompson Institute, and Drs. Joe Elkinton and John Burand at the University of Massachusetts. In the past 3 years, John's efforts have been directed at improving the field performance of Gypcheck, the registered gypsy moth virus product. He is pursuing several approaches simultaneously: to improve the harvesting and processing of the virus from infected larvae; to improve the field persistence of the applied product by adding adjuvants (UV protectants) to the formulation; and to optimize the dosage rate and timing of application. John is responsible for overseeing quality control of the registered product and is the contact person for interacting with other Forest

Service units, the National Park Service, and private industry in the use of the virus.

Recent publication:

Podgwaite, John. 1987. Field evaluations of Gypcheck - 1987. *In* Proceedings of the 1987 National Gypsy Moth Review. Charleston, WV. December 7-10, 1987. pp. 188-189.

**Norm Dubois** is a microbiologist who has for many years been involved in the research and development of *Bacillus thuringiensis* (Bt) for use against the gypsy moth and spruce budworm. He recently isolated a strain of Bt, NRD-12, that is more potent against the gypsy moth and certain other lepidopterous larvae; this strain has been commercialized by Sandoz Inc. and marketed as Javelin R and SAN-415. Norm works closely with industry to develop and evaluate new or engineered Bt strains and improved formulations for use against forest defoliators, and recently completed a manuscript that summarizes the comparative potency of over 1,000 Bt strains that he has evaluated through bioassay over the past 10 years. He is cooperating with two major laboratories to evaluate biochemically the gene products of the HD-1 and NRD-12 strain of Bt and assists the Forest Service in developing guidelines to assess the bioburden (microbial makeup) of commercial formulations and therefore assure their safety and reliability. Norm is presently involved in an evaluation of the use of stickers when added to several Bt formulations.

Most recent publication:

Dubois, N.R., R. Reardon, and D. Kolodny-Hirsch. 1988. Field efficacy of the NRD-12 strain of *Bacillus thuringiensis* (Bt) against gypsy moth, *Lymantria dispar* (L.). *J. Econ. Ent.* 81(Dec).

**Mike McManus** is a forest entomologist and the project leader of the work unit whose major interest is in the area of IPM (integrated pest management) development and implementation. He has been actively involved in the development and conduct of the Maryland IPM Project and co-chairs the Technical Working Group of the AIPM (Appalachian Integrated Pest Management) Project. Although his past research on the gypsy moth emphasized understanding larval behavior, specifically dispersal behavior of early instars, he currently is involved in developing a monitoring system for the insect through collaborative research with Drs. Elkinton (University of Massachusetts), Ravlin (Virginia Poly-



tech), Schwalbe (USDA APHIS), Webb (USDA, Agricultural Research Service), and Saunders (Penn State University).

Additionally, Mike is working closely with Drs. Maddox and Jeffords (Ill. Nat. History Survey) and Webb (ARS) to introduce and evaluate exotic species of microsporidia that were isolated from gypsy moth populations in Europe. These microsporidia are important mortality-causing agents in Eurasian gypsy moth populations and hopefully may become a significant addition to the natural pathogen complex that affects the insect in the United States.

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## Gypsy Moth Articles of Interest

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Dubois, N.R., R. Reardon, and D. Kolodny-Hirsch. 1988. Field efficacy of the NRD-12 strain of *Bacillus thuringiensis* (Bt) against gypsy moth, *Lymantria dispar* (L.). *J. Econ. Ent.* 81(Dec).

McManus, M., and D. Twardus. 1988. Identifying gypsy moth early larval instars. USDA Forest Service NA-FB/p-32.

Jones, Alice. 1987. Persistence of Dimilin in small forested watersheds and its impact on invertebrates in a headwater stream. *In Proceedings of the 1987 National Gypsy Moth Review*. Charleston, WV. Dec. 7-10, 1987.

Parkin, C.S., and J.C. Wyatt. 1982. The determination of flight-lane separations for the aerial application of herbicides. *Crop Protection* 1(3), 309-321.

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## Defoliation Update

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Gypsy moth defoliation in 1988 encompassed 719,302 acres, a decrease of 44 percent from 1987. As shown on this issue's cover chart, 1988 defoliation is a low point over a 10-year period. States with the most dramatic decreases are New Jersey (down 92 percent), Pennsylvania (down 65 percent), Connecticut (down 97 percent), and Massachusetts (down 100%).

Two "leading edge" States report marked increases in defoliation; West Virginia is up almost fourfold, and Michigan is up almost twofold.

Ohio is preparing for increasing populations in 1989. Dick Barth of the Ohio Department of Agriculture reports that 4 northeastern Ohio counties, Ashtabula, Geauga, Lake, and Trumbull will likely be quarantined in 1989. All timber products, christmas trees, nursery products, and outdoor household products leaving these counties for other destinations in Ohio will be required "certified free" of gypsy moth.

The Ohio Gypsy Moth Management Council recently met to develop a State policy for gypsy moth control. The Council consists of approximately 35 representatives of State agencies, Federal agencies, conservation groups, Ohio State University, and city and county governments. It is an excellent forum for debate and is intended as a technical advisory group for gypsy moth management within the State. For more information about the Council contact:

Richard Barth  
Ohio Department of Agriculture  
Division of Plant Industry  
8995 East Main Street  
Reynoldsburg, Ohio 43068

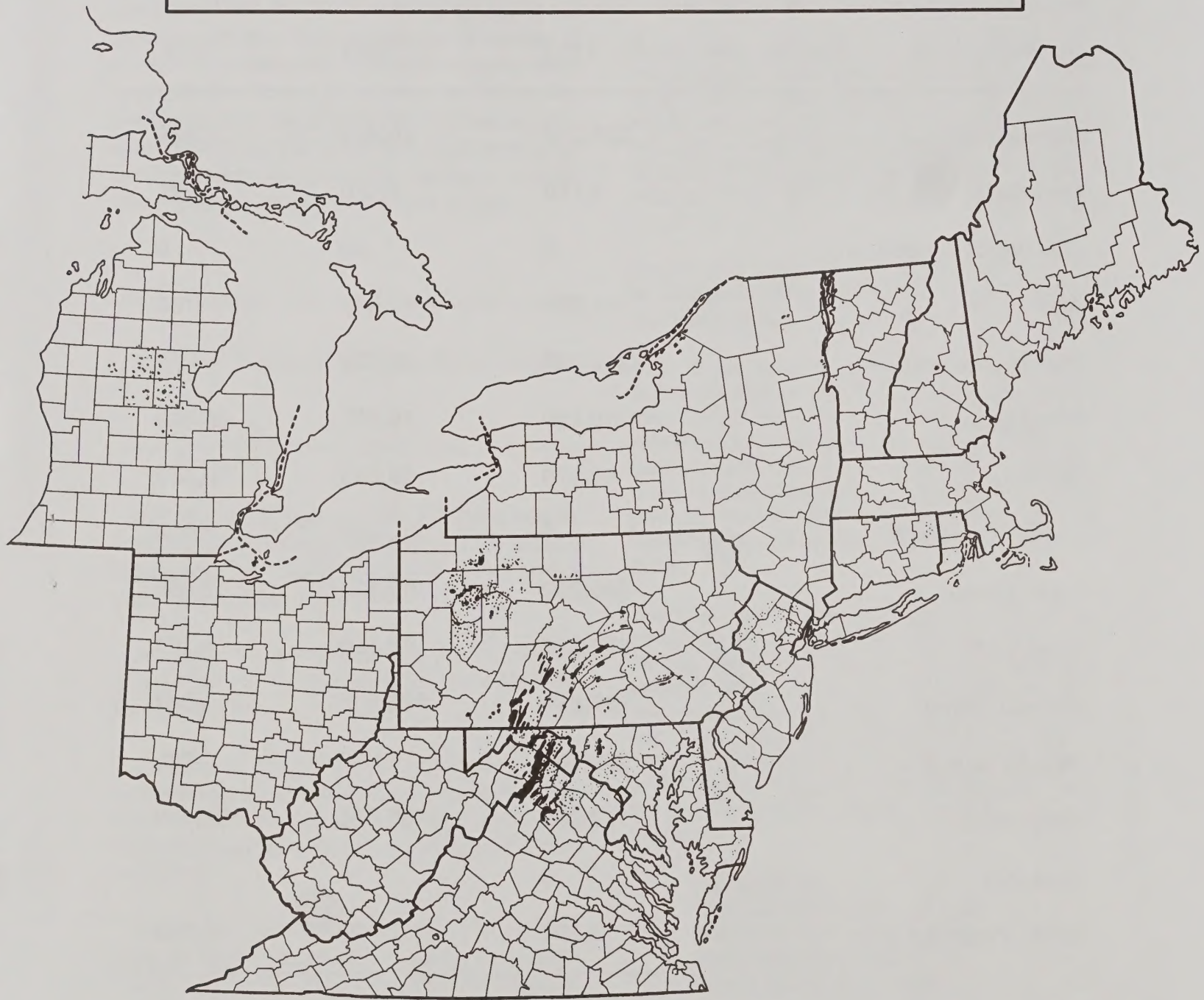


## ACRES OF GYPSY MOTH DEFOLIATION, 1986-1988

State	1986	1987	1988
Connecticut	237,237	65,364	1,639
Delaware	3,118	2,530	791
District of Columbia	0	12	0
Maine	11,572	648	100
Massachusetts	343,091	28,739	0
Maryland	58,190	76,803	58,507
Michigan	61,370	39,443	70,350
New Hampshire	0	290	1,015
New Jersey	280,290	95,104	7,430
New York	175,365	55,150	15,700
Pennsylvania	987,819	880,335	312,092
Rhode Island	219,150	5,050	725
Virginia	27,259	67,695	191,000
Vermont	0	0	703
West Virginia	8,250	12,490	59,250
Grand Total	2,412,711	1,329,653	719,302

Compiled by H. Machesky, USDA Forest Service,  
Forest Pest Management, October 1988.

# **GYPSY MOTH DEFOLIATED AREAS IN THE USA – 1988**



Prepared by H.Machesky, USDA For. Serv.,  
Forest Pest Management, Morgantown, WV.



# PENNSYLVANIA BUREAU OF FORESTRY, FOREST PEST MANAGEMENT

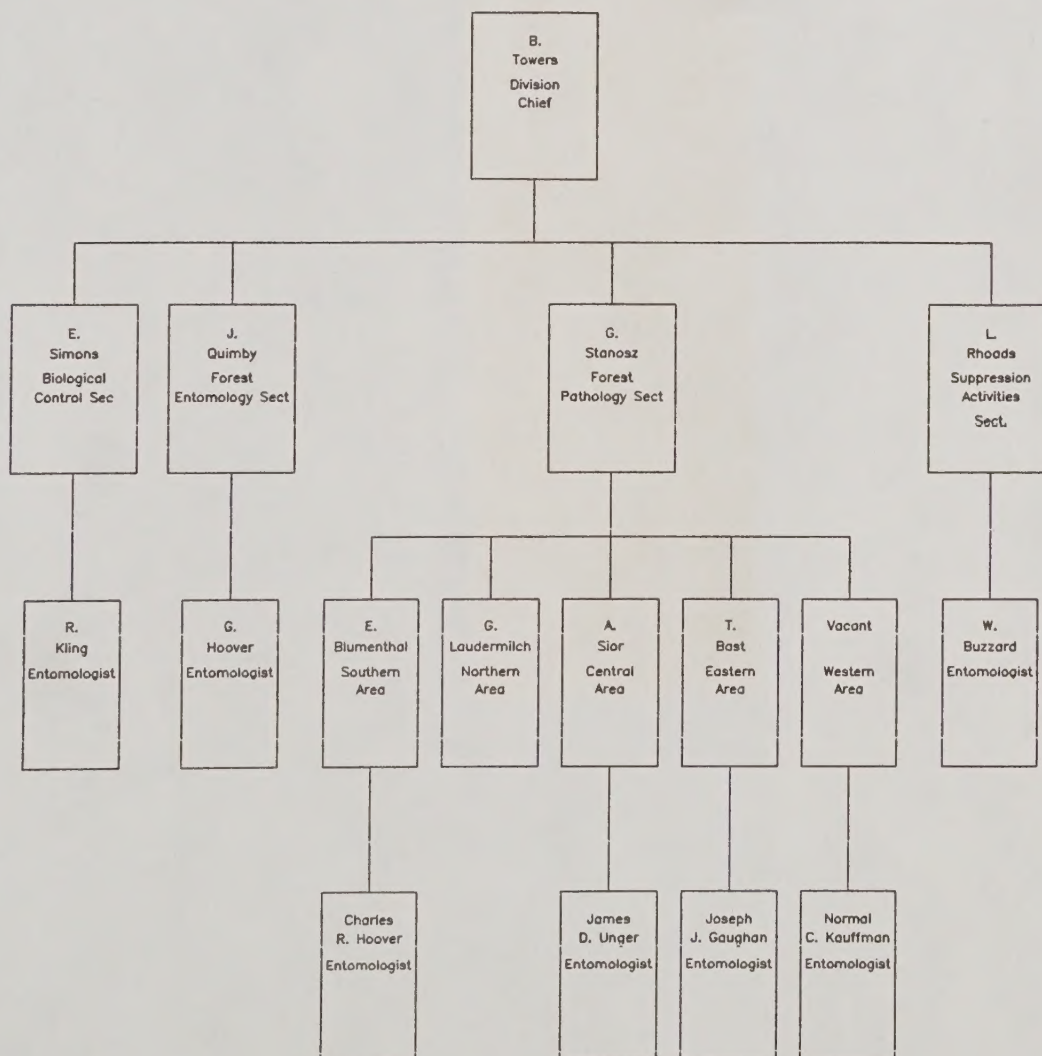
As an indication of current interest in gypsy moth suppression monitoring, Barry Towers, Pennsylvania's Division Chief of Forest Pest Management, has transferred William Buzzard, former Field Entomologist with the Bureau's Western Area, to Forest Pest

Management Headquarters in Middletown, Pennsylvania. Bill's title is Suppression Activities Monitoring Specialist.

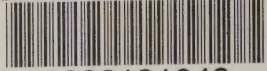
Bill's new duties will include: 1) monitoring suppression activities, 2) quality control, 3) applying new methodology, 4) conducting field trials of new insecticides, 5) improving methods, and 6) training of field personnel.

An organizational chart for the Pennsylvania Bureau of Forestry, Division of Forest Pest Management shows the new organization of the professional staff.

## Bureau of Forestry Division of Forest Pest Management



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